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Forensic Questioned Documents in Criminal Justice: Scientific Tools, Courtroom Admissibility, and Challenges

المستندات الجنائية المشكوك في صحتها بالنسبة للعدالة الجنائية: الأدوات العلمية، المقبولية أمام المحاكم، والتحديات



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Abstract

Forensic document examination is a highly specialized branch of forensic science that focuses on determining the authenticity of disputed documents. Practitioners use a variety of scientific techniques to detect forgery, alterations, and other forms of document tampering, including ultraviolet (UV) and infrared (IR) imaging, electrostatic detection (ESDA), and high-resolution microscopy. Despite its evidentiary value, this discipline has received limited recognition in Pakistan's legal system. The study aimed to assess the role of forensic questioned documents in criminal investigation and its evidentiary limitations in the justice system of Khyber Pakhtunkhwa, Pakistan. The researcher conducted qualitative research by interviewing five forensic document examiners who work at the Peshawar Forensic Science Laboratory; along with fifteen public prosecutors, and five defense counsels. Since there are a limited number of forensic document examiners in the provincial laboratory, a census sample was used, while purposive sampling was employed for public prosecutors and defense counsels who had been involved in experiences with documents related cases. Thematic analysis of interview transcripts identified key themes, including chain of custody, process of forensic analysis, judicial perception, limited weightage of forensic reports, forensic capacity gaps. Findings revealed that the most frequent disputed documents received

المستخلص

يُعد فحص المستندات الجنائية فرعاً تخصصياً دقيقاً من علوم الأدلة الجنائية، يركز على تحديد مدى صحة المستندات المتنازع عليها. يستخدم الممارسون مجموعة متنوعة من التقنيات العلمية لكشف التزوير، والتحريف، وأشكال العبث الأخرى بالمستندات، بما في ذلك التصوير بالأشعة فوق البنفسجية (UV) والأشعة تحت الحمراء (IR)، والجهاز الاستاتيكي للكشف عن الكتابة الخفية (ESDA)، والفحص المجهر عالي الدقة. ورغم القيمة الإثباتية لهذا التخصص، إلا أنه لم ينل سوى اعتراف محدود في النظام القانوني الباكستاني.

هدفت هذه الدراسة إلى تقييم دور المستندات الجنائية المشكوك في صحتها في التحقيقات الجنائية، ومعرفة حدود قيمتها الإثباتية في نظام العدالة في إقليم خيبر بختونخوا بباكستان. أجرى الباحث بحثاً نوعياً عبر مقابلة خمسة من فاحصي المستندات الجنائية العاملين في مختبر بيشاور للأدلة الجنائية، بالإضافة إلى 15 مدعياً عاماً و5 من محامي الدفاع. ونظراً لمحدودية عدد فاحصي المستندات في المختبر الإقليمي، تم استخدام عينة الحصر الشامل، بينما اعتمدت العينة القصدية للمدعين العامين ومحامي الدفاع الذين سبق لهم التعامل مع قضايا متعلقة بالمستندات. حدد التحليل الموضوعي لنصوص المقابلات محاور رئيسية شملت: سلسلة الحيازة (Chain of Custody)، إجراءات التحليل الجنائي، الإدراك القضائي، الوزن القانوني المحدود للتقارير الجنائية، والفجوات في القدرات الفنية. وكشفت النتائج أن أكثر المستندات المتنازع عليها وروداً

Keywords: forensic sciences, questioned documents, VSC 9000/HS, forensic report, forgery detection, criminal justice

الكلمات المفتاحية: علوم الأدلة الجنائية، المستندات المشكوك في صحتها، جهاز VSC 9000/HS، التقرير الجنائي، كشف التزوير، العدالة الجنائية



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by the lab, were stamp papers, cheques, academic degrees, Nikah Namas (marriage certificates), burnt documents, mutation records, and even writings on walls, leaves, and human skin. Tasks such as ink differentiation, indented writing detection, and signature verification are currently performed using VSC 6000/HS and ESDA-2 apparatus however, they require more advanced instruments such as VSC 9000/HS and high-resolution microscopes for optimal results. Courts treat forensic reports as corroborative rather than primary evidence. Major challenges include delays in reports, poor stakeholder coordination, and limited qualifications and training of experts. The findings suggested that the role of forensic analysts need to be enhanced by providing them advance training. Further, policy reforms and mechanism of collaborative relationships between the relevant stakeholders for the pursuance of criminal investigation need to be developed for effective justice system administration

1. Introduction

The significance of forensic science in the criminal justice system has grown significantly in providing correctness, transparency and fairness in legal decisions. Forensic questioned document (FQD) examination is one branch of forensic science that uniquely contributes to the criminal justice system by determining the source or origin, legitimacy or authenticity, and integrity of written materials that are still vital for resolving legal, financial, commercial, and personal matters [1]. The documents used in legal analysis by the experts include identity cards, contracts, certificates, financial records, and handwritten notes that are frequently used as evidence in disputes, verifications, legal claims, and investigations [2].

Further, documentations like contracts or agreement papers are also essential part of any business which sometimes becomes disputed between the parties. The most common offenses include documents are forgery, fabrication, counterfeiting, unauthorized changes to documents, as well as placement of documents to mislead investigations like suicide notes at a crime scene. Document fraud costs people around the world

للمختبر هي: أوراق الطوابع (Stamp Papers)، الشيكات، الدرجات العلمية، عقود الزواج (النكاح)، المستندات المحترقة، سجلات الملكية، وحتى الكتابات على الجدران وأوراق الشجر والجلد البشري. تُنفذ حالياً مهام مثل التمييز بين أنواع الحبر، وكشف الكتابة الغائرة (Indented Writing)، وفحص التواقيع باستخدام أجهزة VSC 6000/HS و ESDA-2؛ ومع ذلك، تتطلب النتائج المثل توفر أجهزة أكثر تقدماً مثل VSC 9000/HS ومجاهر عالية الدقة. وتتعامل المحاكم مع التقارير الجنائية كأدلة مؤيدة (قرائن) وليست أدلة أولية (قاطعة). وتشمل التحديات الرئيسية: التأخر في إصدار التقارير، ضعف التنسيق بين الجهات المعنية، ومحدودية المؤهلات والتدريب لبعض الخبراء. خلصت النتائج إلى ضرورة تعزيز دور المحللين الجنائيين من خلال تزويدهم بتدريب متقدم. علاوة على ذلك، أوصت الدراسة بضرورة صياغة إصلاحات سياسية وتطوير آليات للتعاون الوثيق بين الأطراف المعنية في التحقيقات الجنائية لتحقيق إدارة فعالة لنظام العدالة.

billions of dollars annually and Pakistan is not an exception in this regard where document fraud is prevalent in land disputes and financial crimes [3]. It is estimated that approximately 70% of court cases in Pakistan involve questioned document-based evidence, underscoring their evidentiary weight. In rural areas, where formal property registration processes are less robust, fraudulent documentation surrounding land ownership and inheritance is especially common. The issues have persisted for years in Pakistan due to lack of modern forensic techniques to resolve them amicably [4].

As a matter of fact, the examination of disputed documents along with the technological analysis always relies on the forensic scientist credibility, skill and interpretation which create component of subjectivity as well. As a result, court of law has always shown grievances pertaining to admissibility of such expert opinion specifically when the methodological apparatus is not drawn on the report and when there is doubt on the expert qualification and certification [5]. Further, in few jurisdictions, courts are not considering forensic document evidence due to examiner impartiality and procedural flaws [6]. Moreover, lack of standard protocols of



scientific examination and procedure to present findings further hampers the credibility of forensic document evidence in court and both prosecutors and defense counsels face hindrance to interpret the technical results of the documents [7].

The scope of FQD encompasses handwriting and signature verification, ink differentiation, detection of erasures and alterations, and recovery of indented writings. Scientific tools such as the Electrostatic Detection Apparatus (ESDA) and Video Spectral Comparator (VSC) enhance these capabilities. ESDA works by applying electrostatic charge on the document to dominant and enhance the previous writing and indented traces, while on the other hand VSC consists of a high range of light sources, including ultraviolet and infrared to discover erased writing, forged entries, and to differentiate between ink compositions which is usually not recognizable by naked eyes. Currently in most state-of-the-art forensic labs, equipment like VSC 8000/HS, along with Raman spectroscopy for non-destructive ink analysis are used to derive the results and to meet the international standards of forensic analysis [8].

In the world of technological revolution, modern advances have broadened the field of forensic science like machine learning algorithms are systemically designed and have high level of accuracy beyond human capacity to analyze and compare handwriting features. Further, system based on artificial intelligence can compare hundreds of handwriting samples rapidly and reduce the forensic expert workload by providing statistical support to expert opinion. In addition, hyper spectral imaging is another emerging form of technology which can differentiate ink composition even chemically same by analyzing through light absorption patterns of different wavelengths [9]. However, the aforesaid technologies are still in their infancy, although they are increasingly becoming

popular across Europe, North America, and East Asia.

In Pakistan, the effectiveness of the forensic technologies has been hindered by technological constraints. Further, governments are unable to pay their maintenance costs which result in non-sustainability of the technology and forensic analysis leading to the discouragement of court to accept forensic reports. Many forensic laboratories are equipped with tools like VSC 6000/HS and ESDA 2 which have the capacity of standard forgery detection, but less effective in more sophisticated or digitally manipulated forgeries. In this regards, forensic questioned document examiners have expressed their grievances that lack of advance equipment's and professional development hampers forensic investigation in Pakistan. Further, organizational funding constraints have become a hindrance for the in-service training of the forensic scientists and their participation in international casework which affects their service delivery [10].

Further, in Pakistan forensic scientists facing hurdles include, but not limited to operational problems like inconsistency of electricity during sensitive analysis, limited reach to consumables and lack of lucrative incentives for the forensic experts. The aforementioned issues do not only linger on the documentation of forensic reports, delays the trial process, but also hampers the reliability of forensic testimony before the court. Such procedural complications leveraged to objection on the evidence integrity by the defense counsels while prosecutors face dual challenges of proving the standardized scientific procedure by the certified expert and clear communication through legal forensic report. In Pakistan still in most of the cases oral testimony is considered as primary evidence and preferred over forensic evidence reflecting a gap in the legal system acceptance of forensic methods [11].



The modern forensic questioned document examination in Pakistan needs capacity building of scientific potential and addressing technological constraints. Addressing the aforesaid issues by providing technologies, international training to forensic document experts, legal and organizational reforms can ensure both the scientific examination techniques and legal admissibility of forensic reports before the court of law [12]. Further, in Pakistan there is legal framework to support forensic techniques supported by a massive organizational framework including Qanun-e-Shahadat Order (QSO), 1984 provides the foundation for admitting forensic evidence as Article 59 allows expert opinions when specialized knowledge such as in medical, ballistic, fingerprint, or questioned document analysis is needed to the court. Furthermore, article 78 of QSO allows proof of official documents, including forensic reports. In addition, Article 164 of QSO enables courts to accept any scientific evidence extracted from modern devices like call data record or geo-fencing etc [13]. Such legal framework embraces forensic evidence and reflects progression in forensic science, but still court consider forensic evidence as corroborative evidence and not primary due to different hurdles like technological weaknesses and unskilled analysis of forensic experts.

Further, Section 510 of the Criminal Procedure Code (CrPC) 1898 allows for the admissibility of forensic reports (without requiring the expert's attendance at trial unless the report is challenged) thereby expediting criminal trials by reducing delays in criminal adjudication. This provision is bolstered by specialized laws such as medical, scientific forensic laws and evidence laws. More specifically, Section 27B of the Anti-Terrorism Act emphasizes the usage of forensic techniques in investigating and prosecuting terrorism [15]; likewise the Control of Narcotic Substances Act validates the admissibility

of forensic reports (Section 34) and mandates that a scientific investigation take place where applicable (Section 47) [16]; PECA 2016 (Section 29) permits digital forensic evidence [17]; and lastly, the Anti-Rape Act, 2021 makes DNA testing mandatory in sexual assault cases. The Police Order, 2002 also directs law enforcement to use scientific methods. However, there is little harmonization across these laws, and judges often lack technical training to interpret forensic statutes in complex cases involving multiple types of evidence [18].

Pakistan's forensic network includes the Punjab Forensic Science Agency (PFSA) with advanced labs, including a Questioned Documents Section; the National Forensic Agency (NFA) in Islamabad; and provincial laboratories in Sindh, Baluchistan, and Khyber Pakhtunkhwa. The Khyber Pakhtunkhwa has a Forensic Science Laboratory works under the operational command of Additional IG Investigation and a regional forensic lab in Swat to provide services to the remote areas of the province. Further, Counter Terrorism Department has also started Initial Forensic Lab (IFL) where the experts will deal evidence only in terrorism cases, but it is in infancy. Questioned Documents Units are established in all aforesaid labs. Yet, the unequal distribution of resources means PFSA is significantly more advanced compared to Khyber Pakhtunkhwa forensic facilities, creating disparities in the service delivery of forensic experts across provinces [19].

In addition, there is a lack of collaboration between forensic laboratories and academic institutions whereas, universities can play a pivotal role in providing certified courses and building the capacity of in-service forensic experts and those students who aspire their career in forensic milieu, but forensic labs in Pakistan often operate in isolation, leading to a gap between scientific innovation and courtroom practices. Also, there



is lack of international collaborations in forensic science because Pakistani forensic scientists don't get the opportunity to join international organizations such as the European Network of Forensic Science Institutes [20].

While Pakistan has a comprehensive legislative and organizational framework for forensic science, but implementation is frequently lacking. Gaps in resource availability and training, obstacles to the standardization of examination methodologies, and a lack of inter-agency coordination must be addressed to produce forensic evidence that is both scientifically and legally valid when presented before the court of law. For example, digital forensics may be integrated into documents by way of document analysis, presently and prospectively. The establishment of accreditation criteria for FQD examiners and the inclusion of forensic science as standard subject matter in law schools will help to substantially improve the role of FQD examination within the criminal justice system. As it currently stands, the presence of inadequacies in the justice system limits document examiners' potential effectiveness as contributors to the system until reforms are made.

1.1. Research Questions

1. What different types of disputed documents are submitted to the forensic questioned documents unit in legal cases?
2. How do legal practitioners perceive the use of forensic reports during criminal trials?
3. How effectively are technologies presently being used in analysis of questioned documents in forensic science laboratories?

2. Methodology

This qualitative research seeks to explore the application of forensic document examination in the

criminal justice of Pakistan, emphasizing scientific techniques, courtroom admissibility, and institutional barriers. A total of 25 respondents were made part of the study including 5 forensic document examiners, 15 public prosecutors and 5 defense attorneys. Since there are few questioned document examiners in the province of Khyber Pakhtunkhwa, a census sampling method was utilized for all available experts associated with the Peshawar Forensic Laboratory. Public prosecutors and defense attorneys were selected through purposive technique as they had first-hand experience with cases involving disputed documents. Therefore, the study included respondents with a significant amount of practical experience and different perspectives, leading to representative sampling throughout the province. In addition, this study was accepted for presentation at the Seventh International Conference for the Arab Society for Forensic Sciences and Forensic Medicine (ASFSFM-2025). The conference took place in Riyadh, Saudi Arabia, at the Naif Arab University for Security Sciences. Prior to accepting the abstract for presentation, several minor revisions were suggested by the scientific committee during the review of the research project. These suggestions included adding five defense attorneys and narrowing the focus of the study to the province of Khyber Pakhtunkhwa, Pakistan. All these suggestions were included in the final study design to further enhance its relevance to the conference participants. The primary data collection methods included semi-structured interviewing, using two sets of interview protocols written in English, one for forensics experts and one for legal practitioners (prosecutors/defense attorneys). However, the actual interviews were mostly conducted in Urdu and Pashto, to enhance both understanding of the interview content, and cultural appropriateness. Face-to-face interviews were



conducted, and informed consent was obtained prior to any interviews being conducted. Many of the interviews were audio-recorded for accuracy and detailed notes were taken after each interview. The interviews were transcribed and translated in English prior to analysis. In addition to the interview data, there was one case study included to further understand the topic. The case study that was selected was about a well-known homicide case in which there was writing on the dead person, so that it would be a way to demonstrate how forensic evidence and handwriting analysis are used, argued against, and accepted in court. This case study provided the opportunity to have a real-life view of how the interview participants' experiences and insights fit into the subject matter under investigation. Thematic analysis was used to interpret the data. Total of 55 initial codes were generated, which were later condensed into six key themes such as the procedure of chain of custody in questioned document analysis, judicial perception, limited weightage of forensic reports, and forensic capacity gaps including delays and technological limitations, Table 1.

2.1. Case Study: Homicide Involving Handwriting Examination on a Victim's Body

During an interview with a forensic document examiner, a unique case was recalled that highlighted the crucial role of forensic science in uncovering the truth and preventing miscarriages of justice. The case involved the discovery of a dead body on which words had been inscribed, alleging that.

"I, Salman (pseudonym) and my accompanied killed Javed (pseudonym) due to personal revenge."

At first sight, the writing that appeared on the dead body reflects a specific accused as direct evidence of an offence. The documented evidence created suspicions around Mr. Salman and other

involved and it could have resulted in the conviction of innocent people with respect to the old practices of investigation, but the skill of forensic experts changes the trajectory of the case. The forensic document examiner did forensic photography of the inscription on the deceased body and scientifically did comparison of the handwriting with the reference samples admitted by Mr. Salam and others accused of the case. The initial comparison revealed no match of the accused writing with the inscription on the deceased body and these findings indicated the possibility of deliberate attempt to mislead the investigators in the case. Further, the forensic examiner expanded the scope of investigation with the assistance of the Police investigation officers and collected handwriting samples from all suspects pointed by the victim heirs including those initially overlooked. After through meticulous analysis of all the samples the handwriting was matched with one of the suspects as the suspects intentionally inscribed the message on the deceased body to mislead the investigation officers. It was the achievement of the forensic examination that did not only exonerate falsely accused but also apprehend the real culprit. This case highlights two important areas. First, forensic document examination is far beyond the conventional examination of papers, cheques, stamp paper, but writing on the human skin was also treated as document streamlining the broad scope of forensic discipline. Second, the case demonstrated the indispensable importance of forensic expertise in the criminal justice of Pakistan as this case study showed that technical expertise and skill of forensic analyst is crucial in the process of fair investigation and justice process.

3. Results and Thematic Analysis

Based on the research questions and the responses collected from the forensic document



Table 1- Themes and codes examples

S. No.	Themes	Example Codes
1	Procedure of Chain of Custody in Questioned Document Analysis	Sealed evidence; Documentation check; Manual records; Lack of digital tracking
2	Common Criminal Cases and Disputed Documents Received by Forensic Lab	Forgery; Property documents; Signatures; Marriage Contracts
3	Judicial Perception and Limited Weightage of Forensic Reports	Corroboration; Judicial skepticism; Cross-examination
4	Procedural Gaps and Defense Strategies of Questioning Forensic Evidence	Delays; Missing documents; Unsealed evidence; Defense exploitation
5	Forensic Capacity Gaps: Delays, Technology Limitations, and Professional Development Needs	Backlogs; Outdated tools; Need for advanced equipment; Lack of training
6	Trends in Forensic Questioned Documents Offences (2020 to June 2025)	Bank fraud rise; Property disputes; Forged contracts; White-collar crime growth

examiners, prosecutors and defense counsels, 55 codes were drawn, and the data was presented into six major themes that highlighted the important areas of questioned document analysis in the criminal justice system. Thematic analysis of interview transcripts identified key themes, including chain of custody, process of forensic analysis, judicial perception, limited weightage of forensic reports, and forensic capacity gaps including delays and technological limitations, offered a comprehensive understanding of the process and current situation of forensic investigation in the courts of Khyber Pakhtunkhwa.

3.1. Theme 1: Procedure of Chain of Custody in Questioned Document Analysis

The proper maintenance of Chain of evidence is a mandatory component of forensic reliability that ensures that each stage of evidence preservation is properly documented and sealed.

International standards emphasize that minor flaws can lead evidence being inadmissible in court and slow down investigations [21]. With respect to forensic document examination, many of the practices reported to respond to these international standards, but at the same time limit their successful

implementation. In this regard, Forensic Examiner 2 indicated that,

"We always receive questioned documents sealed in a parcel (evidence container), directly from the investigating officer. Along with the parcel, there is docket (evidence submission form) that lists forensic evidence and the specific questions we need to address during scientific examination".

Thus, there is a significant dependence upon sealed submissions and solid records to protect against the loss of or alteration of evidence during the chain of custody. Forensic examiner 3 described what occurs next,

"Once the parcel reaches our Evidence Receiving Unit, we first check the official stamp and documentation. If everything is in order, we log it in the register and send it to the concerned section for scientific analysis, but in case any of the mandatory documents like first information report copy, or official stamp is missing or tempered; we don't take the case until and unless the required query is addressed".

This procedure reflects a disciplined method of receiving evidence and that all procedural steps must be followed before evidence can be accepted as having been determined to be authentic or not.



Finally, forensic examiner 1 described the process of reporting required,

“After completing the scientific analysis of evidence, we record the results at the reception (evidence receiving unit). One copy stays in our laboratory record, and another is sent, usually via a courier service, to the Superintendent of Police, Investigation or the police station and eventually before the court of law”.

The evaluators noted that though there is a level of correspondence at every phase for maintaining accountability, there are multiple points where this corresponds through the usage of manual records, physical seals and courier services. In contrast there are many multiple jurisdictions in which you can create digitally tracked laboratory samples which provide capabilities such as biometric lock access controls and bar-coding systems. The failure to introduce any of these technology-based processes creates a void in the way these processes operate in Pakistan. When manual processes must be used; it creates an opportunity for delay or error or to provide a basis for a dispute in court, particularly in cases where a defense attorney will attempt to question the reliability of the evidence that is presented before the court.

The only areas where these methods comply with chain of custody are where manual processes exist; and since electronic capabilities do not currently exist there is an overall lack of transparency for the adherence to the chain of custody and can introduce doubt. Updated automated systems will increase the reliability of investigations as well as improve the court's willingness to accept evidence of questioned documents [19].

3.2. Theme 2: Common Criminal Cases and Disputed Documents Received by Forensic Lab

In many criminal and civil cases, questioned documents are frequently acting as a key

component. Evidence from secondary sources suggests that in many legal systems, the outcome of many cases of forgery, fraud, property disputes and contract disputes depends on the validity of writing. Because of this, forensic document examination is an important tool to help in providing justice [22]. The respondents to the current study confirm these findings by identifying common types of cases and documents submitted for analysis in this context.

As a public prosecutor sums,

“In most of our cases, disputed documents appear in forgery, financial fraud, cheques dishonor, property transfers, and fake marriage contract disputes. Documents like property sale agreements, Nikah Namas (marriage certificates), and cheques often become the core evidence in proving the accused's involvement”.

This shows that central to litigation in Pakistan have significant legal and financial documents such as property and marriage records. Defense Counsel 3 expressed concerns about those documents' reliability,

“We frequently see disputed documents being misused to target innocent individuals. Errors in initial investigation, improper seizure of evidence, or biased assumptions can lead to wrongful accusations”.

They cited some examples of indigenous areas where there was a lack of clarity and inconsistency in how the prosecutor interpreted records, resulting in potential miscarriages of justice. Finally, the forensic experts pointed out that they have a wide variety of material that they analyze. As one of them described,

“The most common disputed items I received for examination are signatures, thumb impressions, seals, and handwriting samples. Property documents and bank-related paperwork make up



the largest share of our workload. We also handle a variety of other materials; including stamp papers, disputed signatures on official documents, Intiqals (Mutation), cheques, official stamps, writing found on walls or unusual surfaces like leaves or even the human body, academic certificates”.

Another examiner highlighted,

“Some cases involve invisible writing, ink differentiation, indented writing, altered writing, forged signatures, and even suspected suicide notes in an alleged suicide case. The variety of disputed material is vast, and each requires a specialized examination process”.

The findings identify areas of similarity and difference among questioned documents in Pakistan compared to international studies. International studies show that most frequently examined questioned documents involve signatures, financial documentation and contracts; whereas, in contrast, the local context reveals some unique patterns involving questioned documents, such as disputes related to marriage contracts and property deeds. The reliance on manual forensic methods and limited access to advanced technologies, such as hyper-spectral imaging or automatic handwriting identification, creates an evident structural gap in the questioned document examination system [23]. Therefore, although questioned documents may be important evidence for the prosecutor or defense, their evidential value may be undermined by procedural inadequacies and limited technological resources.

3.3. Theme 3: Judicial Perception and Limited Weight of Forensic Reports

The forensic document evidence in court is seen with careful attention rather than based on assumption. Around the globe, though the value

of forensic science is greatly recognized by the courts, they hardly treat it as conclusive, it often needs to be supported by other relevant evidence as well [24]. The reflections from the respondents in this study are alike difficulties within the context of Pakistan, highlighting how legal attitudes play a vital part in shaping the evidentiary weightiness of forensic reports.

A Public Prosecutor 12 emphasized the optimistic contribution of such reports,

“The forensic document reports are generally trusted by the judges, especially when the witness testimony and circumstantial proof support it. In numerous cases, forensic validation of fake or false signatures straightly led to convictions”.

This indicates that forensic findings can have a solid impact on outcomes of the case when they support other evidence. At the same time, Defense Counsel 4 offered a different perspective,

“Courts don’t blindly accept the forensic reports. We strongly challenge the reports if they lack supporting evidence and clarity. Without cross checking, it’s risky to overreliance on one expert’s opinion. In countless cases even photocopied documents, such as referenced samples and self-confessed decade old writing samples from dairies have been inspected, raising doubt of evidence manipulation and leading courts to disrespect the forensic document reports completely”.

This cautiousness shows that how carefully the courts approach forensic evidence, any blunders in gathering documents, doubts on reference samples, or questions over genuineness of evidence can lead to weaken the legal proceedings and its impact. These challenges have been acknowledged by the forensic examiners themselves. One mentioned,

“In judiciary the weight is often given to clear and well-prepared forensic reports. Though, in practice, our findings are typically regarded merely



as corroborative evidence, which means in final judgment, they hold fewer worth. Even when our scientific investigation visibly confirms modified, fake, or rigging, it is not considered as ultimate proof, and it often makes reservation about the truthfulness of forensic investigation”.

Another examiner added,

“During trials, often such partial weightage hinders the proper use of forensic expertise. If higher priority were given to the forensic evidence, it could meaningfully improve conviction correctness and improve the justice process. Though, physical evidence often weakens the credibility of forensic results when submitted late”.

These reflections are closely aligning with Pakistani courts practices, where influence of forensic evidence is often weakened by procedural errors. In judicial procedures, even courts sometimes dismissed the ballistic evidence when sent for examination after the weapon had already been held in custody, raising serious questions about probable post-recovery interference [3]. Likewise, when the collection of document evidence is not properly done, evidence logs are tempered, or delays in handling of evidence lead to the unacceptability of such forensic reports. Though these reports are recognized by the court as valid evidence, but their partial influence on final decisions of the case stresses the organizational and procedural hurdles in completely incorporating the forensic techniques into the justice system of Pakistan.

3.4. Theme 4: Procedural Gaps and Defense Strategies for Questioning Forensic Evidence

Limitations in procedures determine the value of the forensic report during trials. Evidence mismanagement provides defense counsels with valid grounds to challenge the forensic finding’s

reliability. Similarly, there is no exception in Pakistan, as one of the respondents in this study mentioned repeated concerns that weaken both the weightiness and the acceptability of forensic reports in court [25].

A Public Prosecutor highlighted how deliberately defense lawyers misuse such weaknesses,

“The timing of forensic reports is often challenged by the defense lawyers, together with the chain of custody, or the qualifications of forensic examiner. We defend such challenges by having an experienced person to provide relevant details and demonstrate their methodological approach. Though, safe and sound custody, on time collection, and evidence submission in a proper way are vital to cover these loopholes”.

Additionally, prosecutor 9 stressed structural problems within the investigative process,

“In numerous cases, most of the FIRs lacking the accurate details about the challans (Police report) and uncertain documents, neglect key annexures like forensic receipts. Before the trial even begins, these gaps hamper the prosecution”.

Defense Counsel admitted that procedural flaws provide fertile ground for challenging forensic reports,

“We mostly emphasis on procedural gaps like incomplete analysis, missing documentation, unsealed or late submissions of evidence. The credibility of the report can be weakened by a small technical defect. For example, if sample reaches the lab after a week of sample recovery, it raises thoughtful reservations on its truthfulness”.

Forensic examiners also acknowledged that unsuitable practices weaken the scientific integrity of the work as forensic examiners 3 and 5 described,

“When evidence is submitted after long time,



inadequately sealed or wrapped, or in the form of copies as a replacement for originals, it affects the scientific value of our findings. In various cases, when the admitted samples are decade's older, it makes accurate comparison useless before the court".

Another examiner mentioned,

"Missing submission form and incomplete documents delays analysis and deter accuracy. Numerous numbers of investigating officers lack awareness of proper handling of evidence, which not only wastes time, but it also straightly hinders the value of forensic examination".

In Pakistan, procedural mistakes can extremely affect forensic evidence credibility in the court. Most of the time judges have pointed out that mishandling of evidence, delays, or not following proper measures for preserving and submitting forensic resources can weaken the authenticity and reliability of the evidence. In forensic document examination, blunders like improper reserve documents, delays in submission to lab, or contamination during the chain of evidence can lead courts to question findings and, it even impacts the final verdict in certain cases [26].

3.5. Theme 5: Forensic Capacity Gaps: Delays, Technology Limitations, and Professional Development Needs

The capacity of the forensic services is one of the greatest challenges to timely and effective justice. Backlogs across the globe and old-fashioned technology may slow down cases, undermine people, and provide the defense with chances to doubt the validity of evidence. These obstacles are even bigger in Pakistan, as trained forensic specialists are lacking, the equipment is outdated, and the training facilities are inadequate, directly

impacting the authority of the forensic document examination in the court [8, 10].

In this context a Public Prosecutor 14 underscored the impact of delays on trial outcomes,

"Delays in forensic reporting slow down trials significantly. With too few experts and overloaded labs, cases lose momentum before reaching court".

From the perspective of the defense, such delays provide tactical advantages,

"Delays are useful for us because they raise questions about the integrity of evidence; also storing evidence for a long time increase the risk of contamination of evidence".

Further, forensic examiners reported with respect to technical aspects of current practices. In this regard one encapsulates,

"Our forensic capacity is limited; that only manage standard forgery which is less complicated, but complex document alterations need specialized skills and upgraded technologies. We presently use VSC 6000/HS and ESDA 2. The VSC contains different light sources such as ultraviolet and infrared that revealed ink variances, tempered or erased writings and altered entries".

Moreover, Forensic Examiner 3 reported,

ESDA operates by applying electrostatic charge to enhance indented writing left on paper from prior writing; that allows us to link the document to other writing on other sheets or notepad to compare or identify overwritten content through systematic means".

Furthermore, Forensic Examiner 2 highlighted necessity of technological upgrades,

"VSC 6000/HS and ESDA 2 have constraints in identifying complex and modern forgeries like chemically modified inks or prints that have been edited digitally. There is an immediate need of VSC



8000/HS or VSC 9000/HS, Raman Spectroscopy for accurate and non-destructive analysis, and advance microscope for microstructural analysis of forensic documents. Without these upgrades, our ability to meet international forensic standards and counter sophisticated criminal techniques remains compromised”.

The issue extends beyond equipment to human capital and infrastructure. As some other examiners stressed, it is crucial to deal with continuous professional development of experts. Examiners need to undergo refresher and advanced training that is in tandem with international standards in forensics and undertake international sharing of cases. In the absence of these, even sophisticated tools may not be fully used. The laboratory must also have a continuous electricity supply to ensure that no important analyses are interrupted; a power failure that might occur during an ESDA examination can cause irreparable damage to the test results. Monetary rewards would also serve to retain good examiners in a profession in which experience is gained over time.

International best practices endorse such observations. A report by the National Institute of Justice suggests that the utilization of such devices as the VSC 8000/HS and ESDA with some sophisticated spectral imaging and Raman analysis will allow the forensic scientists to identify even submicron variations in ink and recreate the order of writing. This is a combination that goes a long way to enhance the evidentiary value of questioned document analysis [27, 28]. In Pakistan, however, the absence of modern equipment, organized professional training, and adequate infrastructure still tends to slow down the analyses and portray the prosecution inability to effectively combat the ever-more sophisticated forgeries.

3.6. Theme 6: Trends in Forensic Questioned Document Offences, 2020–June 2025

The cases that concern questioned documents and other forensic evidence have been varying in number recently, with different forms of crimes appearing. Although these trends are not only the shifts in criminal behavior but also the more general social, economic, and institutional ones [29].

In reference to the analysis of questioned document cases, one of the forensic examiners has indicated that,

“In 2020, we worked on 85 questioned document cases, most of which concerned property disputes, cheques forgery, and forged marriage contracts. It had reached 129 in 2021, and the bank fraud and forged signatures increased significantly”.

Moreover, as forensic examiners looked back the following years, they said,

“In 2022, our cases were 96, most frequently of which were land transfer documents and altered agreements. In 2023, it again rose to 110 cases, partly because of an explosion in contentious financial products”.

Another forensic investigator, who was writing about a more recent era, stressed,

“In 2024, we analyzed 88 cases, and one of them was the forgery of legal contracts and manipulation of official seals and further, we have already handled 65 cases till June 2025, most of which include the wills being tampered with or the property being sold by means of fraud”, Figure 1.

And finally, an element of the bigger picture reported by one of the examiners that,

“The differences in the dimensions and trends of the offenses indicate the change in investigative priorities, changing crime typologies, and economic situation”, Table 2 .

The answers indicated that the number of questioned document cases is directly affected by



Table 2- Year wise number of cases and trends

Year	Number of Cases	Trends in Cases
2020	85	Property disputes, Cheque forgery, Forged marriage contracts
2021	129	Bank fraud, Forged signatures
2022	96	Land transfer documents, Altered agreements
2023	110	Rise in disputed financial products
2024	88	Forgery of legal contracts, Manipulation of official seals
(Jan –Jun) 2025	65	Wills tampered, Fraudulent property sales

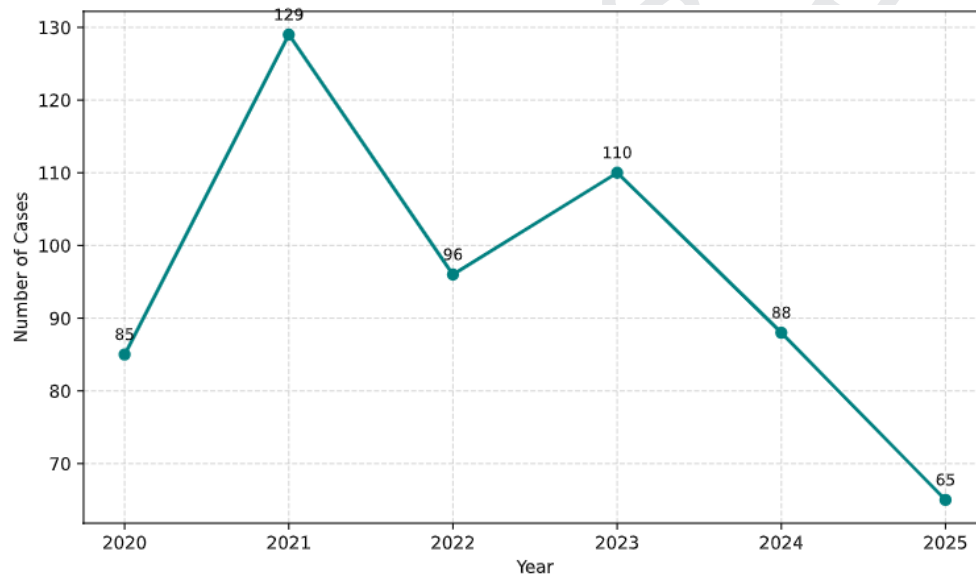


Figure 1- Year wise trends in questioned documents cases (2020-June 2025)

societal changes, and they are not constant over time. This increase in 2021 was in line with the economic slowdown in the post-COVID-19 period, which saw more opportunities in economic and contract fraud due to the increased dependency on banking and real estate transactions. The decline in 2022 was, however, an indication of the shift of investigative target and backlog management instead of a decline in such crimes. Financial instruments and forged legal document cases started to increase again by 2023 and 2024, which means that white-collar offenders have learned how to use the loopholes in the system.

White-collar crimes, especially those that are of a forgery nature, tend to vary in developing economies

regarding economic cycles and organizations. Moreover, the areas in the background, like property transfer, inheritance cases, and economic fraud, are always prevalent. These results indicate that the differences observed in Pakistan follow the tendencies observed in other parts of the world, where instances of crimes of document character are usually reflective of the general structure and economic limitations [30, 31].

The fact that the number of document forgeries and conflicts is very high which demonstrates that questioned document offenses are too intertwined with the Pakistan's legal systems. It shows the acute necessity of the development of state-of-the-art forensic technologies and system change to meet



the ever more sophisticated forgery techniques and to enhance the effectiveness of forensic services to the law enforcement agencies.

4. Conclusion

This research work was carried out to explore the pattern, organizational and legal status, and technological aspects of forensic document examination in Khyber Pakhtunkhwa Province of Pakistan. Findings revealed that the most frequent disputed documents received by the forensic labs from courts and police were stamp papers, cheques, academic degrees, marriage certificates, burnt documents, mutation records, and even writings on walls, leaves, and human skin in cases like forgery, suicide, land disputes, inheritance etc. The aforementioned documents and offences revealed the socio-economic aspects of Pakistan where economic conflicts, land disputes and contractual obligations have been embedded in the justice system. Further, forensic examiners as well as prosecutors emphasized that forensic reports in court is given less weightage and considered as a corroborative evidence rather than primary evidence while defense counsels pointed to procedural loopholes, delayed submission, and reliance on photocopies as a reference samples that compromise the credibility of forensic document evidence. Further, tasks such as ink differentiation, indented writing detection, and signature verification are currently performed by using VSC 6000/HS and ESDA-2 apparatus however, they require more advanced instruments such as VSC 9000/HS, high-resolution advance microscope and Raman Spectroscopy to address the shortcoming and for optimal results. It was also revealed to provide in-service and international standard training to forensic experts to build their forensic capacity to meet the skills of qualified and certified experts. In

short, it is safe to argue that forensic questioned documents play a pivotal yet undervalued role in the criminal justice of Pakistan. To address the structural and technical limitations; strengthening the role of forensic report in the judicial process, and investing in advance forensic technologies are crucial steps towards ensuring that forensic questioned document examination can effectively contributes to the rule of law and upholding justice in Pakistan.

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Conflicts of Interest

The author declares no conflicts of interest.

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